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I, JANENE PEISKER, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2004901230 for a patent by GEORGE ROBERT BRAUN as filed on 09 March 2004.

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Patents Act 1990

PROVISIONAL SPECIFICATION

Invention Title: **Fising Lure**

The invention is described in the following statement:

FISHING LURE

FIELD OF THE INVENTION

The present invention relates generally to fishing equipment and, in particular, relates to a fishing lure and a system for operating and controlling same.

BACKGROUND OF THE INVENTION

It is generally accepted that larger fish seek out smaller distressed fish as a wounded fish is an easier catch. The intended prey may either swim slowly, erratically or may twitch. The larger fish, sensing the vibrations caused by those motions, seek out these distressed fish. Tuna and marlin are known to have fluid filled sensory canals with tiny hair like receptors that are sensitive to vibrations enabling these predators to detect small vibrations in their environment.

Current fishing lures on the market attempt to replicate the motion of a distressed prey usually by shaping the body of the lure to mimic a distressed fish as it travels through the water. In addition, current fishing lures use bright paint, reflective markings or decals in an attempt to replicate the visual appearance of the intended prey.

However, there are various problems associated with trying to replicate the visual appearance of the intended prey. In order to accurately replicate a wide variety of intended prey in a multitude of environments an angler must have at their disposal a large selection of different lures to select from. This requirement increases the expense and equipment needed for fishing.

Electronic fishing lures are known in a general sense but none of the known electronic fishing lures allow sustained and consistent vibrations that can be timed or controlled to suit the environment or intended catch. In addition, none of the known electronic fishing lures can accurately replicate the motion of a fish through water.

Therefore, there remains a need for a fishing lure which can accurately simulate the motion of a fish, particularly when distressed, and which improves on the effectiveness and usability of known fishing lures.

Any discussion of documents, devices, acts or knowledge in this specification is included to explain the context of the invention. It should not be taken as an admission that any of the material formed part of the prior art base of

the common general knowledge in the relevant art on or before the priority date of the claims herein.

SUMMARY OF THE INVENTION

In accordance with a first aspect of the invention there is provided a fishing lure including:

an illumination means;

a body having walls defining a water tight cavity;

a power source within the cavity; and

a control circuit, within the cavity, connected to the power source and the illumination means wherein said control circuit controls the supply of power to the illumination means such that, in use, light is emitted from the illumination means.

In a preferred embodiment of the invention, the illumination means is located within the cavity and the emitted light is visible through the walls of the body. In an alternative arrangement, the illumination means is located externally of the cavity on an exterior surface of the body. The walls of the body are ideally translucent or transparent and the light emitted by the illumination means can include a plurality of different colours. The illumination means preferably includes a plurality of different coloured light emitting diodes (LEDs), however a plurality of neon or incandescent light sources with coloured filters can alternatively be used.

In a preferred embodiment, the intensity of light emitted by each LED is individually controlled with the LEDs consisting of a plurality of red, green and blue LEDs. The plurality of LEDs are arranged into groups with each group including at least one red, green and blue LED located in close proximity to each other. By grouping the LEDs together in this manner, in use, light emitted by the adjacent LEDs can combine to produce light of a non primary colour. The non primary colour produced can be altered by changing the intensity of light emitted by one or more of the LEDs in each group via the control circuit. The groups of LEDs can be spaced uniformly with respect to the fishing lure such that the entire surface of the body can be illuminated. The ability of the fishing lure to emit a multitude of different colours provides the angler with a highly versatile lure that eliminates the need for the angler to have that their disposal a multiple number of different coloured lures.

In another embodiment, the illumination means includes a light source operably connected to a flexible fibre that is placed within the cavity. The fibre is preferably of a sufficient length to be located throughout the cavity and act to carry and transmit light from the source. Of course, different fibres may be used for different coloured light sources and by placing the different fibres in close proximity throughout the cavity it is possible to illuminate the cavity with non-primary colours. In an alternative embodiment the fibres may be wound around the exterior of the cavity.

In accordance with a further aspect of the invention, there is provided a fishing lure system including:

a fishing lure having a body with a water tight cavity;

a rechargeable electrical power source, within the cavity, and a first inductor operatively connected to the at least one rechargeable power source;

a charger located remotely from the fishing lure, including a second inductor, the charger operatively connected to an external power source, wherein locating the fishing lure in proximity to the charger replenishes the rechargeable electrical power source.

Preferably, the second inductor includes an opening and a portion of the body is located within the opening during recharging of the electrical power source. Alternatively, the second inductor may include a planar support surface with a portion of the body being located on the planar support surface during recharging of the electrical power source.

In accordance with a further aspect of the invention, there is provided a fishing lure including:

a body having a first portion and a second portion in connection therewith;

the first portion having walls defining a water tight cavity;

a power source within said cavity;

at least one actuator, within the cavity of the first portion and in operable connection with the second portion, said actuator, in use, imparting movement to the second portion; and

a control circuit, connected to the power source and the at least one actuator, wherein the control circuit controls operation of the actuator.

Preferably, the control circuit controls the actuator according to a desired pattern of movement of the second portion. The first portion may be shaped substantially similar to the head and/or body of a fish and the second portion is preferably shaped similar to a tail with the pattern of movement preferably mimicking that of a fish in distress.

In accordance with another aspect of the invention, there is provided a fishing lure including:

a body having walls defining a water tight cavity;

a power source within the cavity;

vibration means, within the cavity, adapted to impart a vibration to the body of the fishing lure; and

a control circuit within the cavity, arranged to apply power from the power source to the vibration means according to a desired operation pattern.

In one embodiment the control circuit is adapted to intermittently apply power to both the vibration means and actuator according to a desired duty cycle and/or frequency. Preferably the duty cycle and/or frequency applied to the vibration means and actuator are different.

In a preferred embodiment, the vibration means includes a motor having a rotatable output shaft and a weight eccentrically mounted on the shaft. The motor and weight may be of the type used in mobile phones having a vibration mode.

In accordance with a further aspect of the invention, there is provided a fishing lure including:

a body having a water tight cavity;

a power source within the cavity; and

a control circuit, within the cavity, including a receiver, wherein the control circuit, in use, controls operational functions of the lure, upon the receiver receiving control signals.

Preferably, control signals are transmitted to the receiver by a remote control unit located remotely from the fishing lure.

By being able to control the illumination and/or intensity and/or duration of any vibrations or movement of a lure via the remote control unit, the angler can advantageously select and change the pattern of movement and colour of the lure

without needing to retrieve the lure from the water. In addition, the angler can conveniently activate and de-activate the operational functions of the lure.

In an alternative embodiment, the control circuit may also include a water sensing circuit having electrodes exposed externally of the walls of the body. In this embodiment the sensing circuit may be adapted to activate the vibration means and/ or the actuator and/or the illumination means when the electrical resistance between the electrodes drops below a threshold. This may occur when the fishing lure is placed in water with the threshold preferably being adjustable.

BRIEF DESCRIPTION OF THE DRAWINGS

Further benefits and advantages of the invention will become apparent from the following description of a preferred embodiment of the invention. The preferred embodiment should not be considered as limiting any of the statements in the previous section. The preferred embodiment will be described with reference to the following Figures in which:

Figure 1 is a photograph of the external appearance of a fishing lure in accordance with a preferred embodiment of the invention;

Figure 2 is a photograph of the internal components of a fishing lure similar to that of Figure 1 with a translucent body;

Figure 3 is a photograph of the external appearance of a fishing lure in accordance with a further embodiment of the invention;

Figure 4 is an electrical schematic diagram of a fishing lure in accordance with a preferred embodiment of the invention;

Figures 5 to 8 are electrical schematic diagrams of alternative embodiments of the invention;

Figure 9A is a perspective view of a rechargeable fishing lure and a charger;

Figure 9B is a perspective view of a rechargeable fishing lure partially located within the cavity of a charger;

Figure 10 is a side view partially illustrating the internal components of a fishing lure according to an embodiment of the invention.

DESCRIPTION OF PREFFERED EMBODIMENTS

Referring to Figure 1, there is shown a photograph of a fishing lure in accordance with an embodiment of the invention. Externally, this fishing lure looks identical to a conventional fishing lure. Indeed, the components of the present invention may be incorporated within the body of a conventional fishing lure.

Figure 2 shows the internal components of a fishing lure similar to that shown in Figure 1. It can be seen from Figures 1 and 2 that the fishing lure 10 includes a body 12 having walls 14 which define a water tight cavity 16. The lure 10 includes a power source in the form of a rechargeable battery 18 within the cavity 16. An illumination means is provided in the form of light emitting diodes 21 that are located at a multiple number of locations within the body of the lure. A speaker 26 is connected to the battery 18 and a control circuit 24 and emits sounds as close as possible to a fish in distress.

The control circuit 24 is arranged to apply power from the battery 18 to the light emitting diodes 21. The control circuit 24 includes a microprocessor 23 which controls the intensity and duration of light emitted by each LED such that the desired light colour is emitted. In addition, the control circuit 24 includes an infrared receiver 25 which receives control signals from a transmitter of a remote control unit. The remote control unit is located remotely from the body and transmits infrared transmission signals to the receiver to control all operational functions of the lure.

The remote control can be used to select various operating modes and parameters such that the body of the fishing lure mimics the actions, appearance, sound and movement as close as possible to the real actions of all types of fish when distressed. Operational modes and parameters control all facets of the lure including which group of LEDs are activated, illumination duration and intensity, vibration duration and intensity and operation of the actuator.

The vibration means is provided in the form of an electric motor 20 and an eccentrically mounted weight 22 on the output shaft of the motor 20. The control circuit 24 is arranged to apply power from the battery 18 to the motor 20 according to a desired pattern such as a desired duty cycle and/or desired frequency. To ensure that the vibration means does not draw excessive current

from the battery, power signals supplied to the motor can be pulse width modulated.

In one embodiment, the control circuit 24 also includes a water sensing circuit having a pair of electrodes 26 and 28 exposed externally of the walls of the body 12. The sensing circuit is adapted to activate the motor 20 when the electrical resistance between the electrodes 26 and 28 drops below a threshold.

In the embodiment shown in Figure 2, the electrode 26 also functions as a means to attach the body of the lure to a fishing line. The electrode 28 shown in Figure 1 also serves to attach one of several fishing hooks 30.

The embodiment shown in Figure 3 is similar to those shown in Figures 1 and 2 but the sensing circuit includes electrodes 32 and 34 which are dedicated to this purpose and do not serve a dual role as in the embodiments shown in Figures 1 and 2.

In use, the water sensing circuit activates when the resistance between the two electrodes 26 and 28, or 30 and 34, drops below a threshold. This will then activate a timing circuit which, in a preferred embodiment, has a cycle time of 4 seconds (2 seconds off and 2 seconds on). This timing may however be varied as desired, for example from 0-60 seconds for both the on and off times. Alternatively, random timings or user programmable timings may be employed. In the latter embodiment, the control circuit may employ a microprocessor or similar device.

A driver circuit is used to switch on the motor 20 of the vibration means. As the motor rotates the weight that is off-centred also rotates thereby creating vibrations of the motor body. The motor body is rigidly mounted to the body of the lure so as to transfer the vibrations to the body of the lure, and hence through to the water.

When the lure is dry, due to being out of water, the control circuit 24 draws an insignificant current from the battery 18, thereby preserving battery life. The water sense electrodes are short circuit proof.

Getting the electronic and mechanical components of the device in to such a small area has in the past precluded this concept from being implemented. By using surface mount electronic components, low stand-by current design and components from the mobile phone industry, miniaturisation is now possible.

Referring now to Figure 4, there is shown an electronic circuit diagram of an embodiment of the present invention.

When the fishing lure is placed in the water a small current will flow via R2 and R3 through water between the two electrodes J1 that penetrate the body of the lure. This current will be sufficient to forward bias transistor Q6 and saturate it. Once Q6 has saturated, Q4 and Q5 have sufficient power to function as an astable multivibrator oscillating at around 0.5 Hz based on the values of R5 and C1 for one phase and R6 and C2 for the other. Resistor values are set high to keep the capacitor values small and also reduce current drain of the circuit. Every two seconds, Q4 will switch off providing enough current through R9 to saturate transistor Q1. It has been found that only 0.2 microamp of current can be drawn from the oscillator without adversely affecting the timing of the oscillator. Also, this is not enough current to start the vibrating motor. The collector base design of the three stages of amplification is used since it has no quiescent current and a massive current gain is excess of 1 million. Two further stages of amplification to boost the 0.1 microamp of bias up to the 100 milliamp required to start the vibration motor. Any current passed into this circuit via R9 will then be amplified up to over 100 milliamps sink capability at the collector of transistor Q2. Although the back emf of the mechanical vibrator is small, diode D1 is used to arrest any problem.

Figure 5 shows a circuit diagram similar to that of Figure 4 wherein merely the values of the resistors and capacitors have been varied so as to change the duty cycle and frequency compared to the circuit shown in Figure 4.

Figure 6, 7 and 8 show electrical circuit schematic diagrams of alternative embodiments of the invention.

The circuit diagram in figure 8 depicts two groups of LEDs 46, 48 connected to a microcontroller 23. The microcontroller 23 accepts commands from the remote control via an infrared receiver diode 52. The microcontroller 23 can operate at 4MHz using an on-chip RC oscillator. The range of the remote control can be maximised by using a hybrid receiver unit.

Each group of LEDs includes a red green and blue LED with a first group being located in the nose portion of the lure with a second group located in the tail

portion. A first inductor 50 is provided in parallel with the battery 18 to facilitate in the recharging of the battery 18.

In a variable timing model of the fishing lure, the on and off times may be adjusted to suit the species of fish to be caught. In random timing models, the lure may use a random number generator in a small micro-controller to create the timing sequence. A multiple number of different timing sequences can be implemented simultaneously. For example, the timing sequence for the vibration of the lure and the actuation of the tail section can be suitably selected to suit the species of fish.

A PC based laptop computer with a parallel port may be used to load a user defined timing sequence into the lure. Alternatively, an infra-red or radio communication port may be employed. Tables may be provided to find the optimum match between the fish species or geographic location and appropriate timings. The user may also be provided the ability to program their own timing sequence for illumination or vibration and/or actuation of the tail section.

With reference to figure 9A there is depicted a charger for recharging the fishing lure. The body of the fishing lure contains the first inductor 50 and the charger includes a second inductor contained in a planar support surface 40. The charger further includes a power cord 42 for connection to an external power source. The rechargeable batteries within the body of the fishing lure are recharged by placing the body of the fishing lure on the planar support surface 40.

An alternative embodiment of the charger is depicted in figure 9B. In this embodiment, the rechargeable batteries with the body of the fishing lure are recharged by placing a portion of the body within a cavity 44 containing a circular inductor.

In a further embodiment, the rechargeable batteries may use the electrodes to recharge the internal battery. The battery charger can either be plugged into a 12 volt car dash socket or may be mains powered.

With reference to figure 12 there is depicted the body of a fishing lure which includes a first or nose portion 55 and a second or tail portion 57. The nose portion 55 is connected to the tail portion 57 by two actuators 59. Each actuator 59 includes a solenoid 61 mounted in the nose portion 55. From each

solenoid 61 extends an arm member 63 which has one end connected to the tail portion 57 via a return spring 65. Other components have been removed from figure 10 for clarity. In use, each solenoid 61 receives an electrical impulse in accordance with a preselected timing sequence selected by the user to replicate the desired movement of the tail portion. The magnetic field created within each solenoid forces each arm member 63 towards the tail portion 57 against the bias of the spring 65. When the electrical impulse ceases, each arm member 63, returns to its prior position. By providing the electrical impulses in an alternative sequence to each solenoid, back and forth motion is provided to the tail portion.

Premium models of the fishing lure may incorporate several of the features described including illumination, vibration, remote control, recharging and tail actuation.

Basic models may be designed to be disposable whereas premium models may be designed to have an extended life span of up to 1000 charge/discharge cycles.

The control circuit may be configured to operate the vibration or activation modes according to any desired duty cycle and/or frequency. Examples are given in the following table:

On Period (seconds)	Off Period (seconds)
1	1
2	2
3	3
3	1
4	2

Any other suitable combination may be employed depending upon the type of fish that the lure is intended to emulate.

Sensitivity of the water sensing circuit needs to be considered with variations of pH levels of water throughout the world. Preferably, the water sensing circuit is adapted to work within a pH range of 5.0 to 9.0. However, operation outside of this range may be desirable.

Similarly, fresh water will be less conductive than salt water and clean water will be less conductive than dirty water. The water sensing circuit employed in the fishing lure of the present invention may be adapted, as necessary, to work in any water conditions. Such adaptation would be considered to fall within the skill of an ordinary person within the art and need not be explained here in detail.

CONCLUSION

A fishing lure constructed in accordance with a preferred embodiment of the invention may incorporate the following features and advantages:

Runs on low voltage battery which makes it safe around water;

Reliable even when the battery reaches the end of its life;

Timed to simulate the motion of a fish, particularly the erratic behaviour of a distressed fish;

Illuminated to produce any desired colour, or pattern of colours, to emulate the body of a bait fish;

Water sense circuit to automatically switch off the lure when it is removed from the water for casting or storage; and

Lures are completely water tight to aid buoyancy and reliability.

As the present invention may be embodied in several forms without departing from the essential characteristics of the invention, it should be understood that the above described embodiment should not be considered to limit the present invention but rather should be construed broadly within the spirit and scope of the invention. Various modifications and equivalent arrangements are intended to be included within the spirit and scope of the invention.

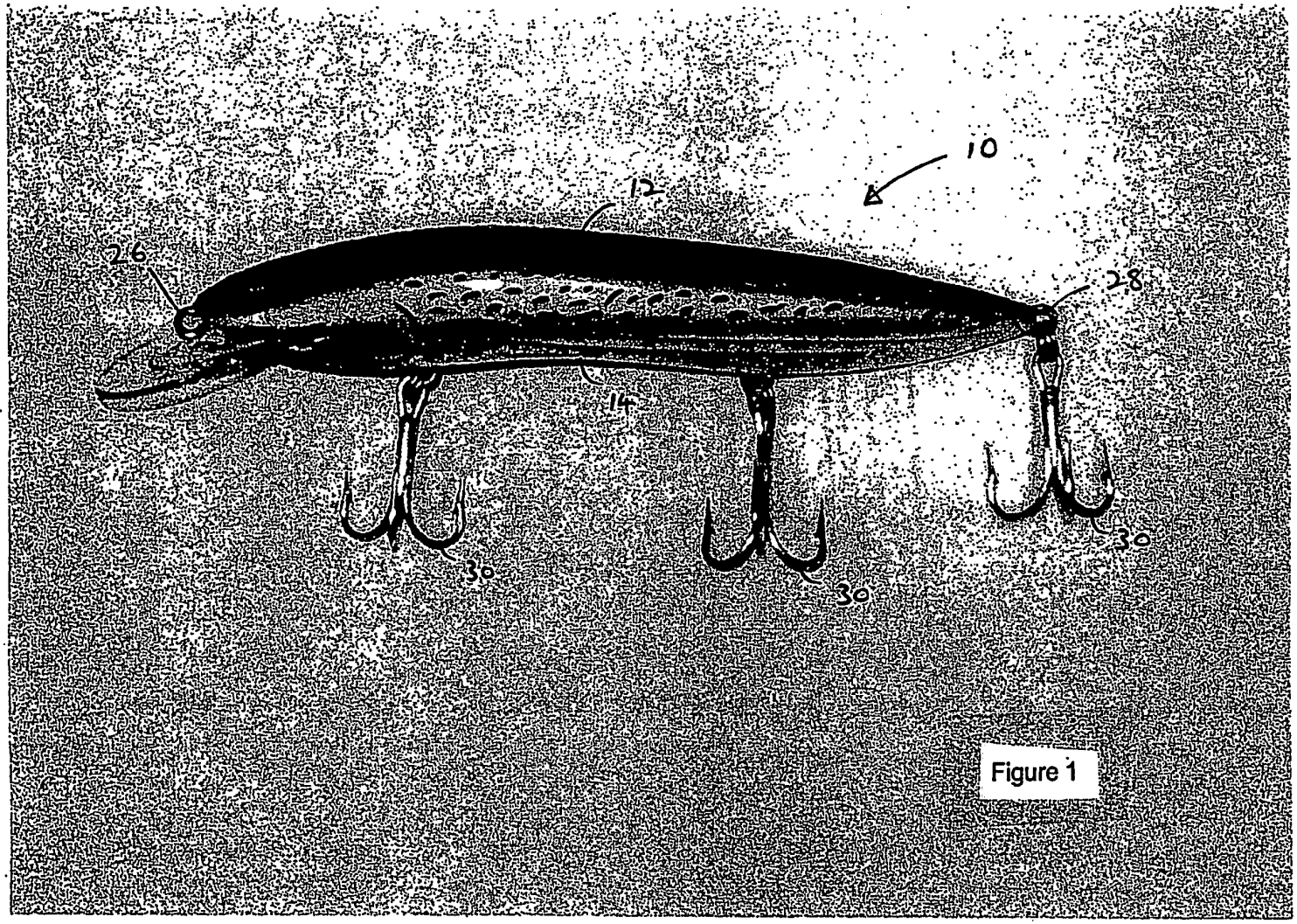

Figure 1

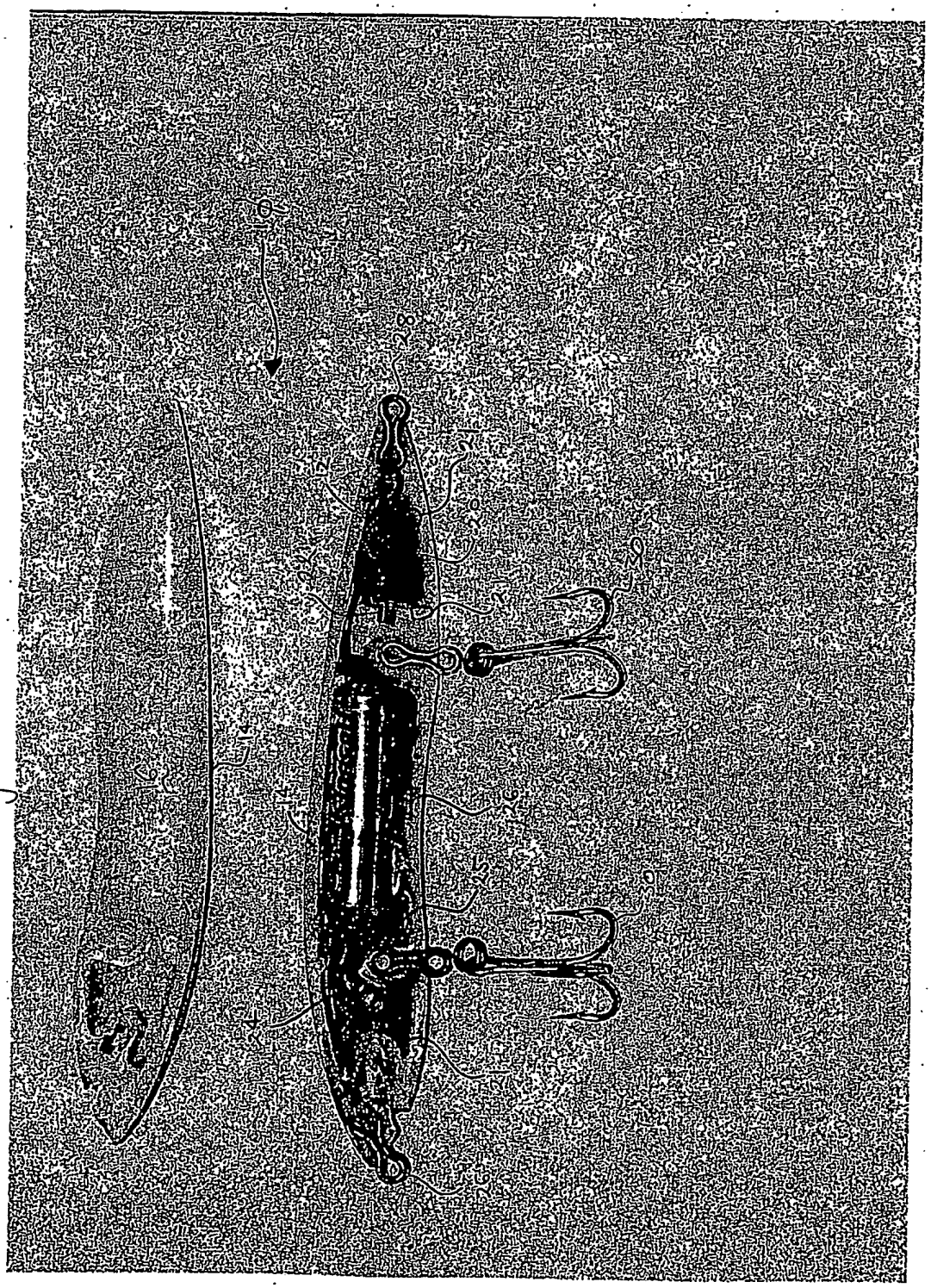

Figure 2

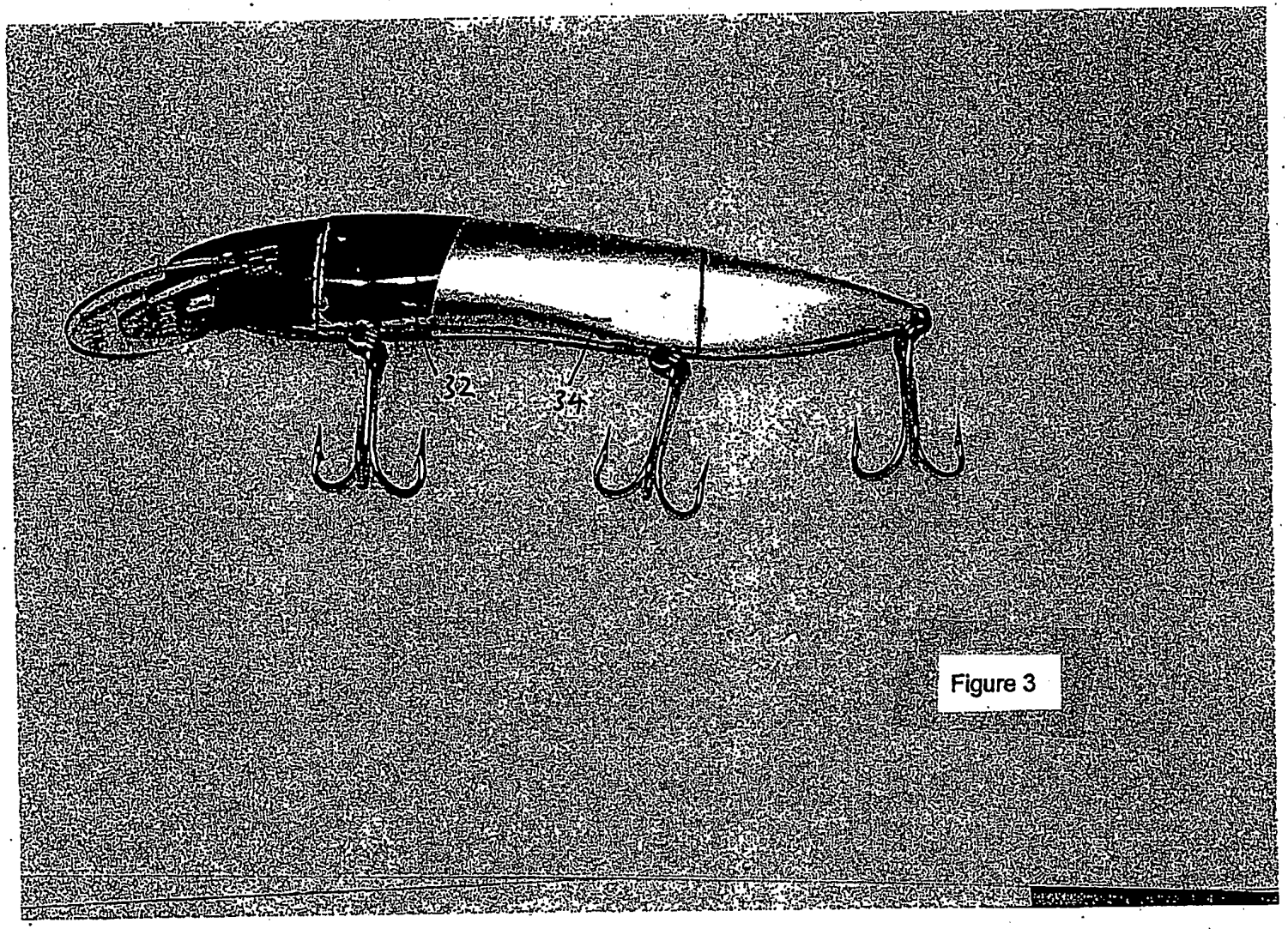

Figure 3

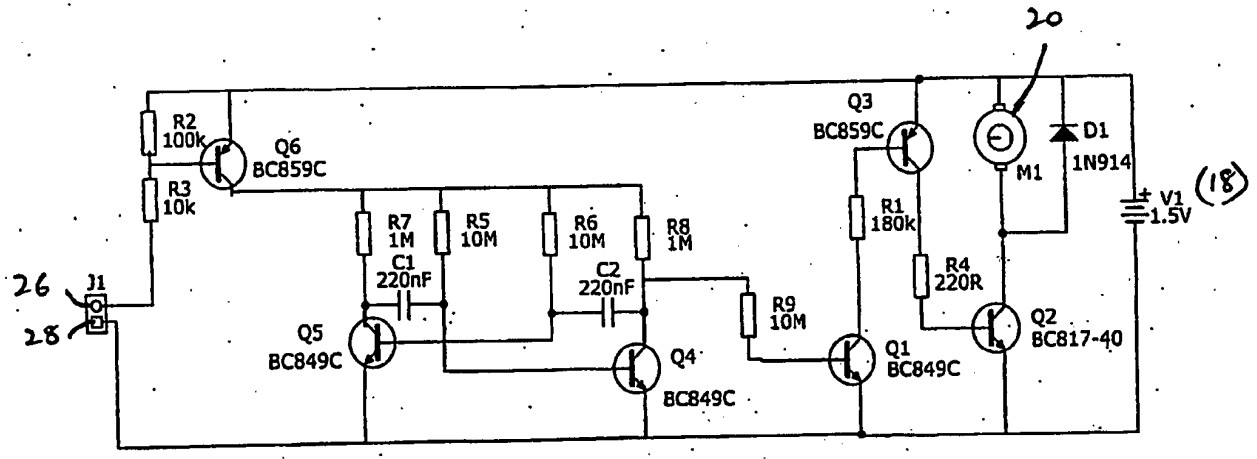

Figure 4

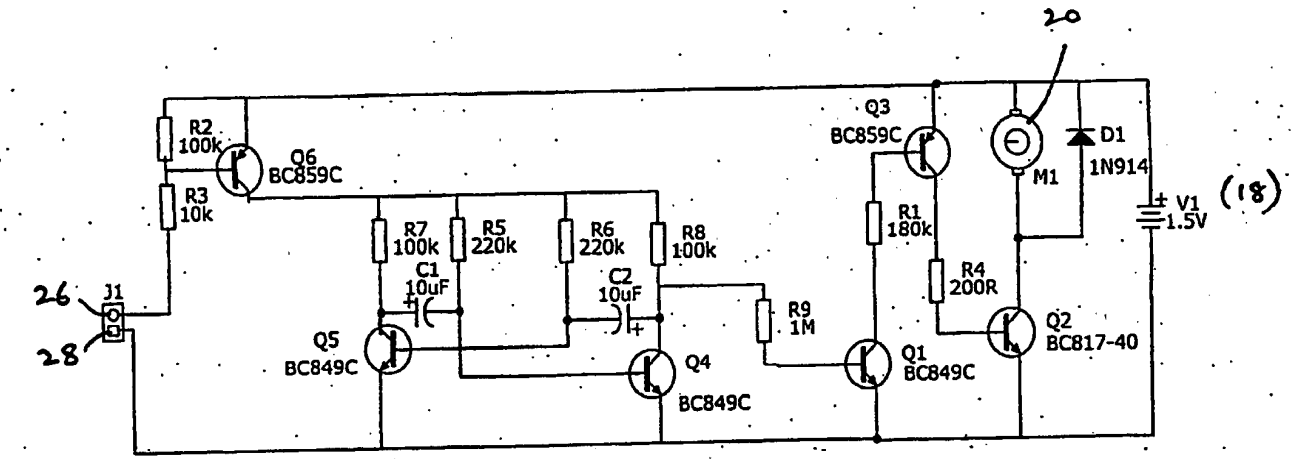

Figure 5

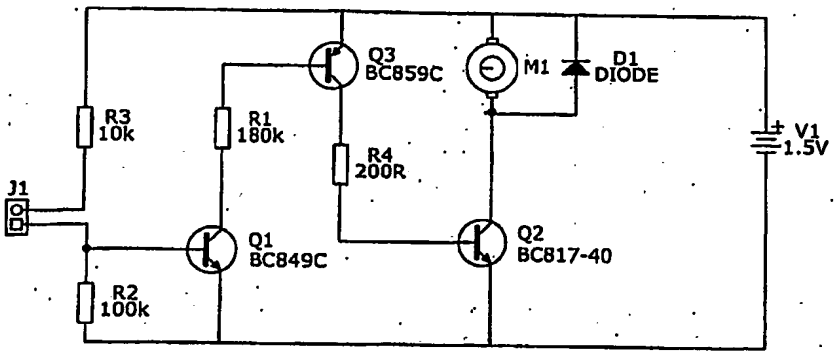

Figure 6

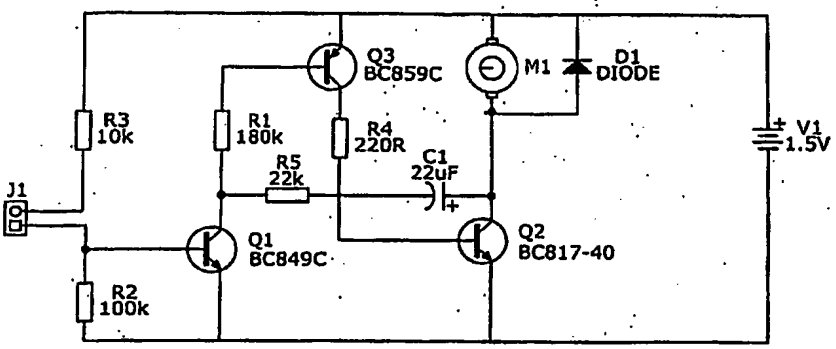

Figure 7

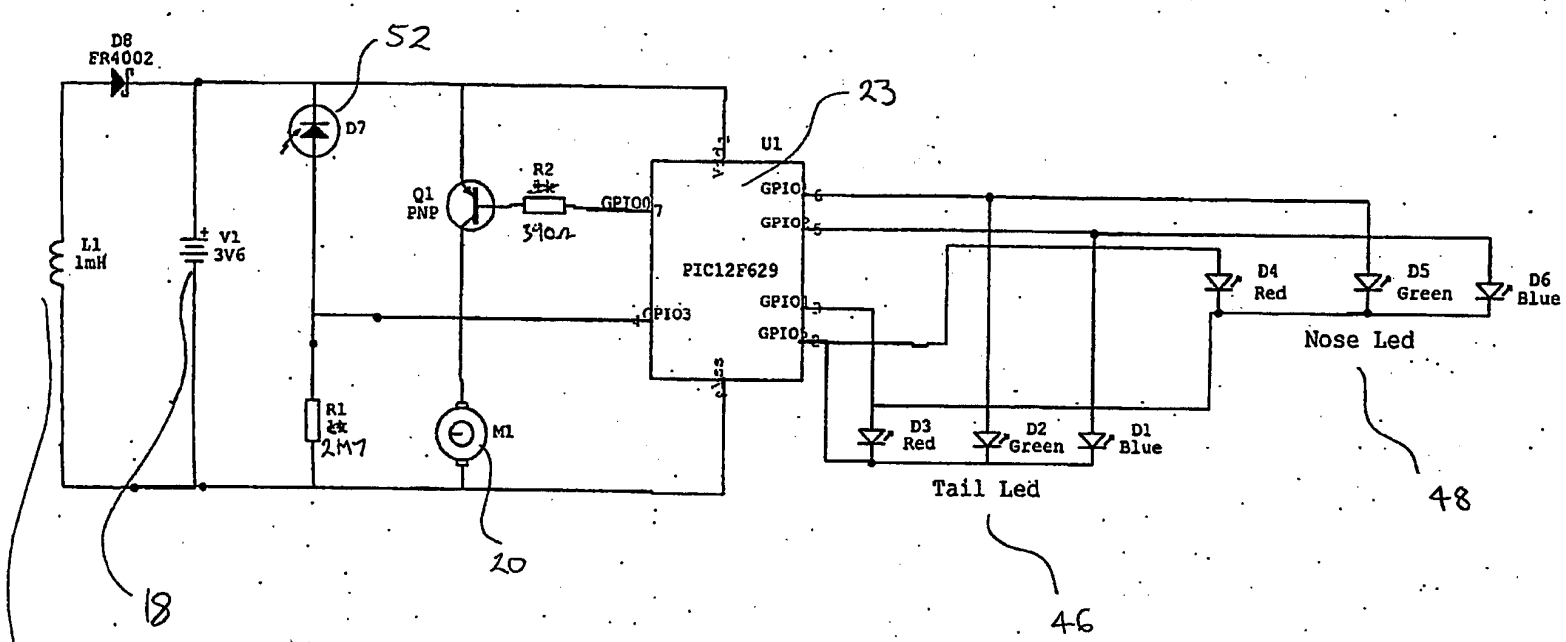
D8
FR4002
52
D7
23
U1
Q1
PNP
R2
390Ω
GPIO0
GPIO
GPIO
PIC12F629
GPIO
GPIO
GPIO3
L1
1mH
V1
3V6
R1
2M7
M1
D4
Red
D5
Green
D6
Blue
Nose Led
D3
Red
D2
Green
D1
Blue
Tail Led
48
46
20
18
50

Fig 8.

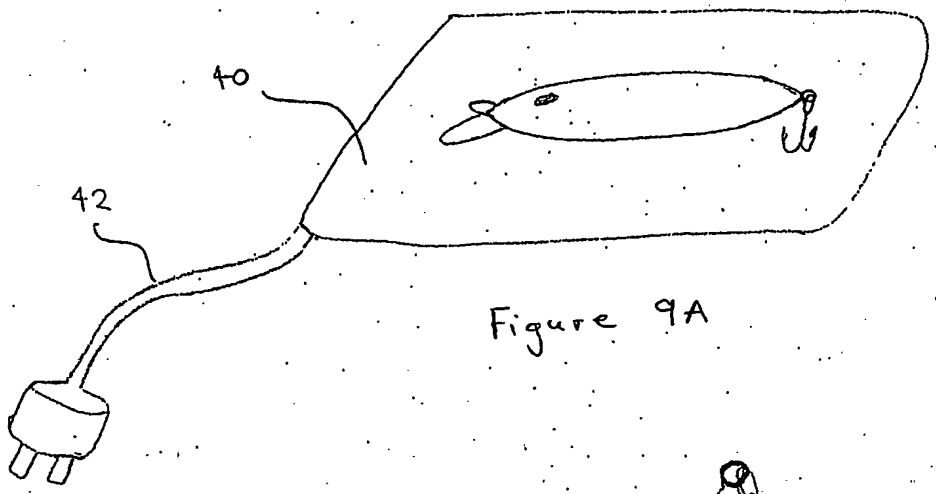

Figure 9A

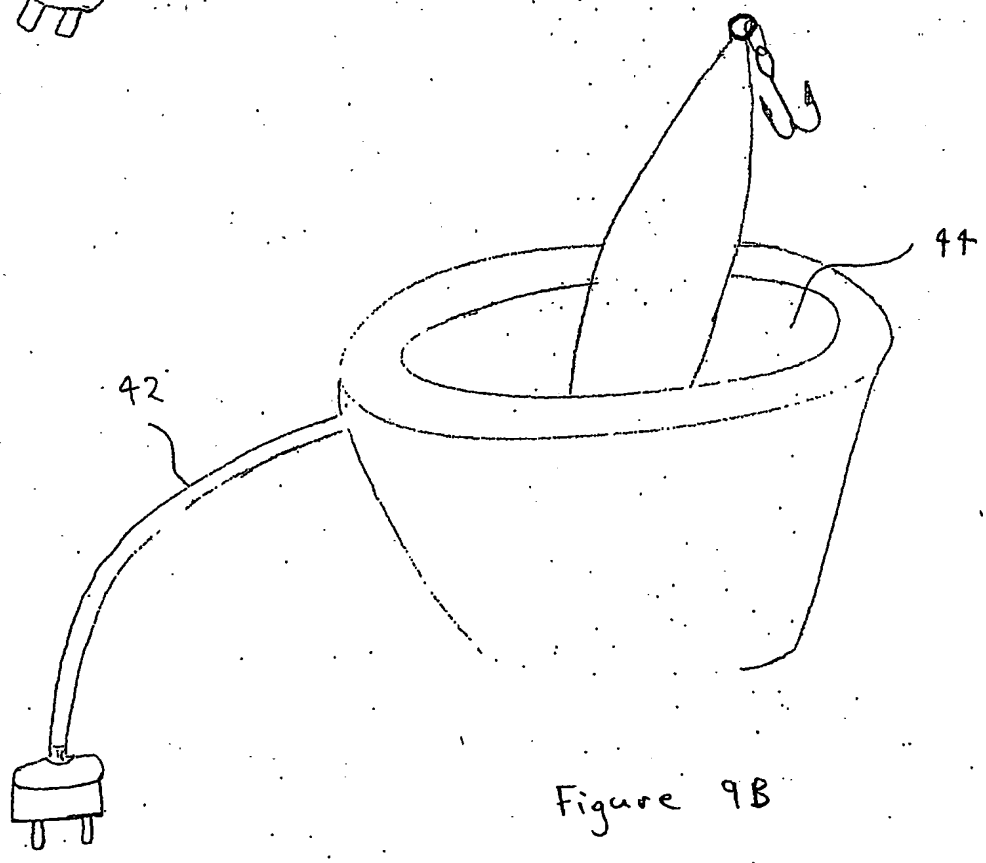

Figure 9B

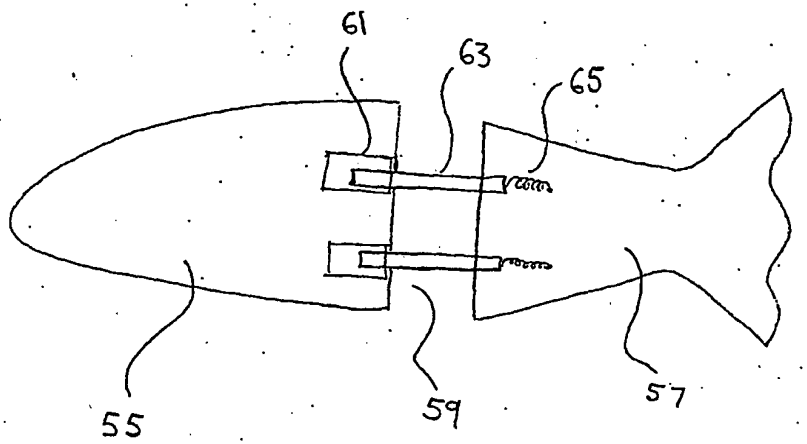

Figure 10